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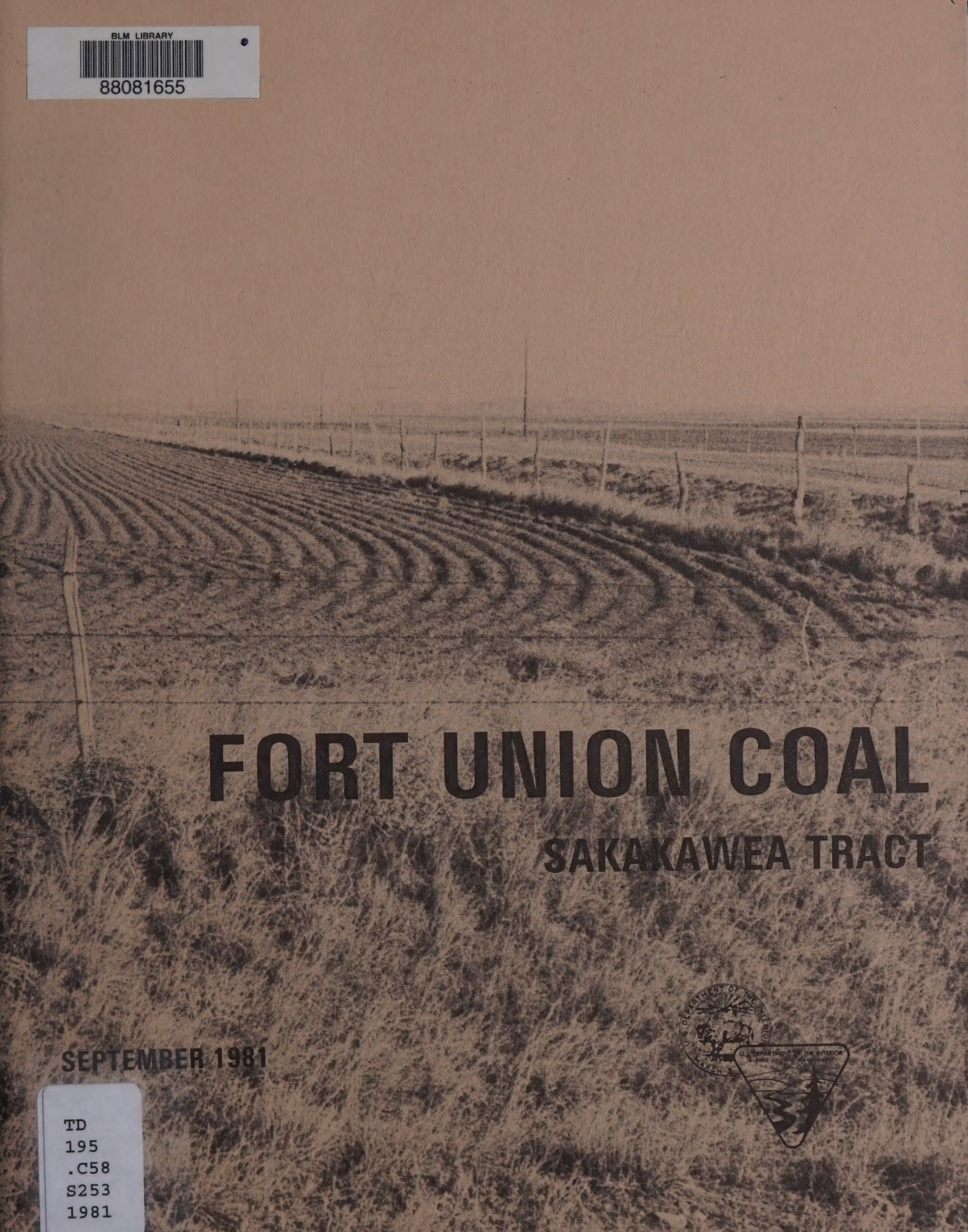

FORT UNION COAL

SAKAKAWEA TRACT

SEPTEMBER 1981

TD
195
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1981

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1981

FORT UNION COAL REGION

SAKAKAWEA TRACT ANALYSIS

SITE SPECIFIC ANALYSIS

MCLEAN COUNTY, NORTH DAKOTA

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September 1981

Michael J. Penfold
State Director

CONTENTS

Site Specific Analysis

Introduction 1
Chapter I — Alternatives 5
Chapter II — Affected Environment 7
Chapter III — Environmental Consequences 19
References 31
Summary Matrix 33
Unsuitability Criteria Results 39

INTRODUCTION

The purpose of this action is to offer 2.0 million tons of federal strippable coal reserves that can be further considered for coal leasing and development to help meet the energy needs of the nation.

This site-specific environmental analysis (SSA) has been prepared for the Sakakawea tract (Map 1) in accordance with federal regulations (43 CFR 3420). It will be used by the Fort Union Regional Coal Team to further consider competitive leasing of federal coal within the tract for a June 30, 1983 coal lease sale schedule. If selected and leased, the Sakakawea tract would contribute 2.0 million tons of federal coal to the regional leasing target. Presently, a regional leasing target has not be established by the Secretary of the Interior. The preliminary regional leasing target will be established in August 1981 and finalized in October 1981.

BACKGROUND

In September of 1980, the Dickinson District Bureau of Land Management (BLM) Office completed the West-Central North Dakota Management Framework Plan (MFP) for Oliver, Mercer, McLean, Stark, and Dunn counties, and a small part of Billings County. The land use planning process included identification of high or moderate potential coal areas, application of unsuitability criteria, identification of resource trade-offs, and consultation with surface owners. As a result of that work, areas were identified that could be further considered for coal development. These areas are available for consideration of new competitive leasing, lease exchanges, and lease modifications.

Following land-use planning, the BLM requested expressions of interest from industry. These expressions, along with other information, guided the U.S. Geological Survey (USGS) in delineating this tract. Results of that work are summarized in this document.

BLM Dickinson District Staff inventoried the tract to determine the site-specific resource values and then analyzed potential environmental effects of coal development on this tract. The unsuitability criteria were further considered and new findings are reflected in this report.

Information from this and other site-specific analysis will be used by the Regional Coal Team during the tract ranking and selection process for a lease sale schedule. The proposed tracts will be cumulatively analyzed in a regional environmental impact statement. Among the alternatives addressed will be different combinations of tracts that also meet a regional coal leasing target.

After reviewing the analytical documents, public comments, and the recommendations of the regional coal team, the Secretary of the Interior will select specific tracts for the lease sale. The successful lessee will be required to submit a plan for mining and reclamation to the Office of Surface Mining (OSM) for review and approval within three years after leasing. In evaluating the plan, OSM will prepare a site-specific environmental assessment or EIS.

Tracts in the Fort Union Region are being considered for leasing in accordance with the federal coal management program adopted by the Secretary, Department of the Interior, in June 1979. The basis of the program was, in part, the Final Environmental Statement, Federal Coal Management Program. Implementation procedures are contained in Federal Regulations (43 CFR 3400). Authorizing actions are the Mineral Leasing Act for Acquired Lands of 1947, as amended; the Federal Land Policy and Management Act of 1976; the Surface Mining Control and Reclamation Act of 1977; the Multiple Mineral Development Act of 1954; the Department of Energy Organization Act of 1977; the National Environmental Policy Act of 1969; the Federal Coal Leasing Amendments Act of 1976 as amended; and Federal Regulations concerning federal coal leasing and development including 43 CFR 3400; 30 CFR 211; and 30 CFR 700-899.

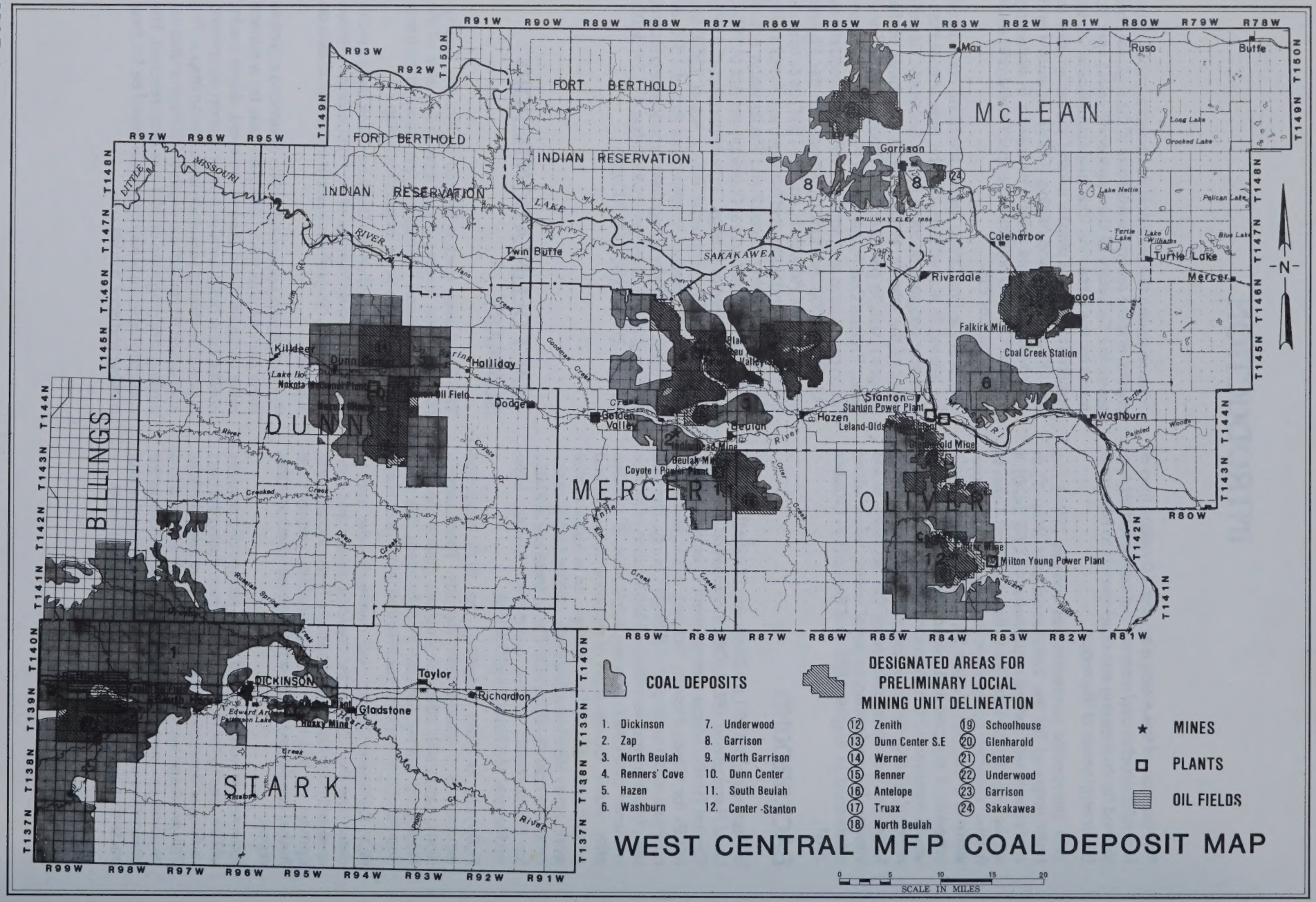
TRACT DELINEATION REPORT SUMMARY

The Sakakawea tract is located in McLean County, North Dakota, located about three miles west of the town of Garrison. For further information on the tracts location and the lands included see Map 1.

The tract is based on the Garrison Creek bed found in the Tongue River Member of the Fort Union Formation (Paleocene). No geologic hazards are known to exist on this tract.

For analytical purposes, the USGS developed a generic mine plan for this tract. This plan calls for a surface mine using front-end loaders, scrapers, dump trucks, coal-haulers, bulldozers, and other support equipment. A possible mining sequence is shown on Map 2. The coal would be mined to a depth of 200 feet or until the limiting stripping ratio of 20:1 has been reached. The most probable end-use of the coal would be for local heating and spot market use.

MAP 1



WEST CENTRAL MFP COAL DEPOSIT MAP

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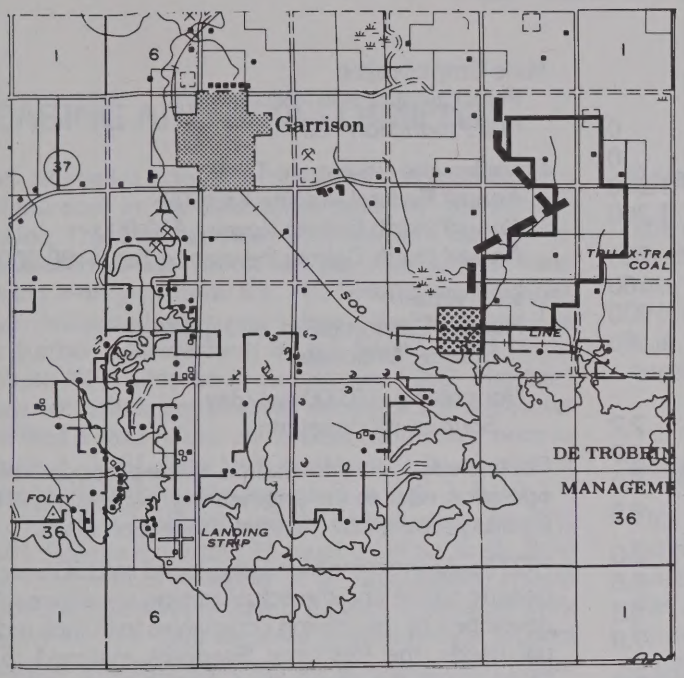
T148N



SURFACE OWNERSHIP

LEGEND

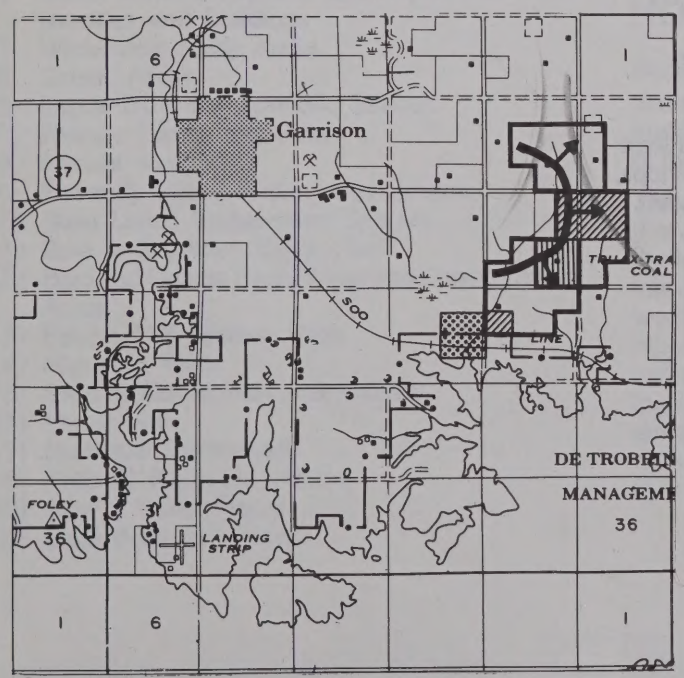
- Private Surface
- Tract Boundary
- Surface Facilities
- Out-of-Pit Haul Roads

-N-

13 - 1950
14 - 1945
23 - 1895

R84W

T148N



SUBSURFACE OWNERSHIP

LEGEND

- Federal Coal
- State Coal
- Private Coal
- Pit Advancement

SAKAKAWEA TRACT

1 0 1 2 3 4 5 6

Scale In Miles

MAP 2

Specific Tract Characteristics:

Acreage:

Surface:	Federal	0
	State	0
	Private	1,360
	Total:	1,360
Coal:	Federal	280
	State	160
	Private	920
	Total	1,360

Coal Reserves/Millions of Tons:

In Place:	Federal	2.2
	State	0.7
	Private	5.9
	Total	8.8
Recoverable:	Federal	2.0
	State	0.6
	Private	5.3
	Total:	7.9

Coal Quality: Average of samples as received from vicinity of tract:

Moisture	36.9%
Volatile matter	27.0%
Fixed carbon	28.5%
Ash	8.5%
Sulfur	0.4%
BTU's/lb	6,565

Surface Disturbance/acres

Mining: Annual rate, 24; Total Life of Mine, 995

Haul Roads: 36

Mine Facilities: 40 - These could include coal load-out, changehouse, office, warehouse, repair shops, storage areas, parking areas and a crushing plant.

Stripping Ratio: Less than or equal to 20:1

Coal Thickness: 5 to 6 feet.

Mine Employment:
Peak Construction - 50
Full Production - 20

Royalties and Severance Taxes:
Annual Federal Royalty, $39,000
Annual North Dakota Royalty, $10,000
Annual North Dakota Severance Tax, $180,000

Water Needs:
Human Consumption, 600 gal./day
Source: Well water

Nonpotable, 10,000 gal./day
Source: pit dewatering

For more specific information on the proposed mining operation refer to the engineering, geologic, and land reports prepared by the tract delineation team.

NOTE: As the mine plans developed by USGS are of a generic nature and the actual mining sequence will be developed by the mining companies to fit their individual needs, the Resource Specialist assigned to the SSAs made the assumption that all lands within the tract boundaries would be disturbed to some degree. Therefore, acreage in the SSA may not always agree with that shown in the Tract Delineation Report concerning acreage disturbance.

CHAPTER I
ALTERNATIVES

LEASING AND DEVELOPMENT

This alternative is to offer for further consideration the federal coal in the Sakakawea tract for competitive leasing. This tract has been identified, as a logical mining unit for a 0.2 million ton per year surface mine having a 40 year mine life. The Sakakawea tract has been delineated within areas designated as acceptable for further consideration in the West-Central North Dakota MFP adopted in Septebmer 1980. The tract does not include any lands for which the surface owner has filed a valid refusal to consent (to mining) prior to March 1, 1981. The tract has been fully cleared of unsuitability criteria numbers 1, 2, 4, 5, 6, 7, 8, 10, 11, 12, 13, 16, 17, 18, 19, and 20 as defined in 43 CFR 3461. Criteria 9, 14, and 15 require further study. With the exception of criterion 3, all unsuitability criteria studies will be completed and fully applied before work begins on the final regional environmental impact study; if not, this tract will be dropped from futher consideration. Criterion 3 will be deferred until mining and reclamation plans are submitted to OSM and North Dakota Public Service Commission for final approval. Current unsuitability concerns are shown on Map 3. The following is a list of unsuitability criteria.

(1) Federal Land System
(2) Rights-of-Way and Easements
(3) Buffer Zones along R/W and Adjacent to Communities and Buildings
(4) Wilderness Study Areas
(5) Scenic Areas
(6) Lands Used for Scientific Studies
(7) Historic Lands and Sites
(8) Natural Areas
(9) Federally Listed Endangered Species
(10) State Listed Endangered Species
(11) Bald and Golden Eagle Nests
(12) Bald and Golden Eagle Roost and Concentration Areas
(13) Falcon Cliff Nesting Sites
(14) Migratory Birds
(15) State Resident Fish and Wildlife
(16) Floodplains
(17) Municipal Watersheds
(18) National Resource Waters
(19) Alluvial Valley Floors
(20) State Proposed Criteria

Relationship to Other Developments

The nearest active mine is the Falkirk Mine 22 miles southeast. The abandoned Custer Strip Mine is one mile east of the tract. Farming and ranching are the only other significant activities in or near the tract, however, a possibility exists for oil and gas development because of interest in the region.

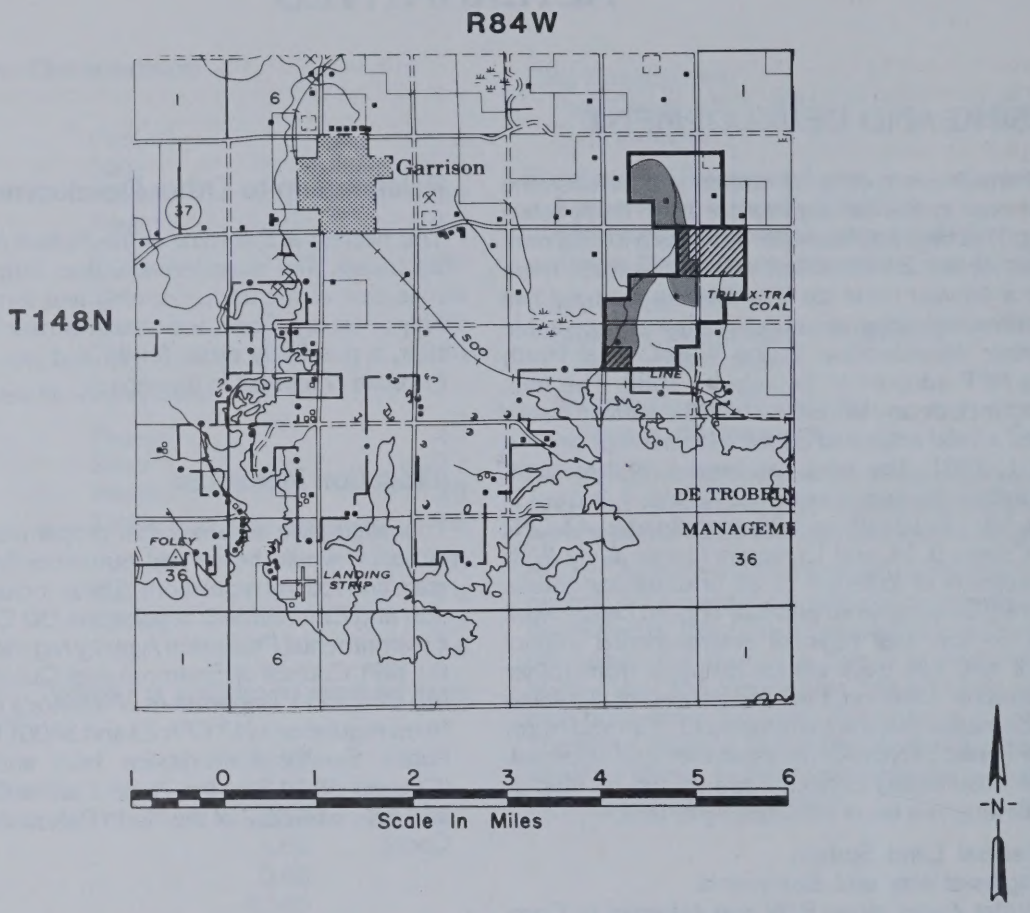
Mitigation Measures

This alternative assumes that proper mining and reclamation would be carried out according to existing state and federal regulations. These include: Reclamation and Enforcement regulations (30 CFR 700-899), Environmental Protection Agency regulations (40 CFR 0-1399), Council of Environmental Quality regulations (40 CFR 211), Department of Interior's coal management regulations (43 CFR 23 and 3400), North Dakota Public Service Commission laws and regulations (Chapter 38-14.1 of the North Dakota Century Code and Article 69-05.2 of the North Dakota Administrative Code).

NO LEASING ALTERNATIVE

Federal coal would not be offered for lease under this alternative. The tract contains 2.0 million tons of recoverable federal coal which represents about 25 percent of the total recoverable reserves.

This limited amount of federally owned coal implies that a mine could probably operate on this tract without the leasing of the federal coal. If the federal coal is not leased, it would probably be bypassed and recovery would be uneconomical. Under this alternative few significant changes would occur to areas underlain by federal coal. If coal mining occurs in the area surrounding federal parcels, however, that mining would influence the bypassed areas, further, bypassed areas would make reclamation efforts more difficult, particularly in the reestablishment of natural appearing slopes.



LEGEND

Federal Coal

Areas being considered as unsuitable by BLM and others based on existing information.

Wildlife Habitat

Note: Detailed maps are available for inspection at the Dickinson BLM District Office. (Rights-of-way too numerous to show.)

SAKAKAWEA TRACT

MAP 3

CHAPTER II
AFFECTED ENVIRONMENT

This section is a description of the current environment with anticipated changes from ongoing trends. Within the Williston Basin there has been an increase in oil and gas exploration and this trend is expected to continue. The physical resources described in this section represent only existing conditions while the social and economic sections account for existing conditions and ongoing trends. It is recognized that the physical resource values may change due to future oil and gas exploration.

TOPOGRAPHY

This tract is located in the Coteau Slope physiographic area of the Great Plains. The area consists of stream-dissected bedrock with a veneer of glacial deposits with rather moderate relief. Drainage is well integrated and only a few lakes and sloughs occur on the tract.

GEOLOGY AND MINERALS

The Tongue River Member of the Paleocene Fort Union Formation makes up the bedrock in the area. This member consists of light buff-yellow, interbedded siltstone, sandstone, and claystone with lignite beds. It is overlain unconformably by glacial debris of the Wisconsinian glaciation.

The Garrison Creek bed is the major lignite resource in the tract. Total thickness varies from 5 to 6 feet. Overburden on the bed ranges from 38 to 80 feet. The tract contains 8.8 million tons of reserve-base lignite (2.2 million tons federal, 0.7 million tons state, and 5.9 million tons fee).

No oil is produced from this tract but since it is located in the Williston Basin, there is at least a minor chance of future production.

PALEONTOLOGY

No fossils of scientific importance are known to occur on this tract.

SOILS AND RECLAMATION POTENTIAL

The soils in the Sakakawea tract have formed in glacial till, outwash, and alluvium. The Williams-Bowbells mapping units dominate the landscape. They are deep, well drained loamy soils of medium to high natural fertility.

As Table 1 indicates, slopes are quite gentle over the area. This, along with loamy surface textures, keeps the erosion potential relatively low.

Soil quality is reflected in the reclamation suitability ratings and acreage figures for the Soil Conservation Service (SCS) Order II county soil survey mapping units in the tract (Tables 1 and 2). Of the 1,280 total acres involved, 1,021 acres (80%) is in the "good" suitability category, 252 acres (20%) "fair," and 7 acres (1%) "poor." Williams-Bowbells mapping units comprise most of the "good." Zahl-Williams and Grail units make up most of the "fair." The seven acres rated "poor" is a small unit of Wabek soils.

The suitability data in Table 2 is displayed by surface landowner because North Dakota law does not allow the transfer of soil material from one landowner to another unless written consent is given. Each surface owner's land must be reclaimed with soil originally removed from his respective holdings. The table therefore indicates the degree of difficulty to reclaim individual landowner holdings based on soil suitability as plant growth material on surface mined land.

HYDROLOGY

This tract is located in a glaciated area and has dead-ice moraine at the surface. This type of surface deposit is characterized by a hummocky pothole topography with poor drainage resulting in the presence of many wetlands. Very little surface runoff occurs from this tract area. Surface drainage that does occur from this area is to Lake Sakakawea located at the south edge of this tract. The surface water use on this tract is for stock watering and wildlife purposes.

There is no groundwater data for this tract. This assessment will be based on that assumption that the hydrologic conditions in this area are very similar to the Garrison tract area.

Groundwater is present in the area in the Fox Hills, Hell Creek, Fort Union, and Coleharbor formations. Within the shallow geology, aquifers occur in the sand and lignite of the Sentinel Butte formation, in the glacial till that lies on top of the Sentinel Butte, and in the buried glacial meltwater channel that runs just to the southwest of this tract. This latter aquifer is call the Garrison aquifer. The mineable lignite is probably an aquifer.

The flow pattern for this system is probably from the pothole wetlands in the northeast down through the till, then through the lignite and sand beds, then down to deeper aquifers and into the Garrison aquifer. The horizontal gradients would be from northeast to southwest.

TABLE 1
SOILS - SAKAKAWEA TRACT

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
BoA - Bowbells loam	1-3	Low	Low	Good	----
BwA - Bowdle loam	1-3	Low	Low	Good	----
ByB - Bowdle-Stady loams	3-6	Low	Mod	Good	----
Co - Colvin silty clay loam	0-1	Low	Low	Fair	Too clayey
FbB - Falkirk and Max loams	3-6	Low	Low	Good	----
GaA - Grail silty clay loam	1-3	Low	Low	Fair	Too clayey
M1C - Max-Zahl loams	6-9	Low-Mod	Mod	Good	----
M1D - Max-Zahl loams	9-15	Mod	High	Good	----
Pa - Parnell silty clay loam	0-1	Low	Low	Fair	Too clayey
Tp - Tonka-Parnell complex	0-1	Low	Low	Fair	Too clayey
WaB - Wabek-Max-Zahl loams	1-6	Low-Mod	Low	Fair	Wabek-excess small stones, too sandy, droughty; Zahl-too clayey
WaD - Wabek-Max-Zahl loams	6-15	Mod	Mod-High	Fair	Wabek-excess small stones, too sandy, droughty; Zahl-too clayey
WbD - Wabek soils	6-15	Mod	Mod	Poor	Excess small stones, too sandy, droughty
WmA - Williams clay loam	1-3	Low	Low	Fair	Too clayey

TABLE 1
SOILS - SAKAKAWEA TRACT

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
WoB - Williams-Bowbells loams	3-6	Low	Low	Good	----
WoC - Williams-Bowbells loams	6-9	Low-Mod	Mod	Good	----
ZwC - Zahl-Williams loams	3-9	Mod	High	Fair	Too clayey

1/ From "Soil Survey of McLean County, North Dakota"

2/ Derived by applying the properties of the soils within the tract which are described in the above mentioned soil survey report and "Official Soil Series Descriptions" to the guidelines developed by BLM-Montana State Office and adapted from information by Wm. Schafer, the Soil Conservation Service (SCS) and the Office of Surface Mining (OSM).

TABLE 2
SUITABILITY OF SOIL FOR RECLAMATION BY LANDOWNER IN THE SAKAKAWEA TRACT

LANDOWNER NUMBER	GOOD	FAIR	POOR	TOTAL
1	64	16	-	80
2	300	60	-	360
3	213	67	-	280
4	33	7	-	40
5	27	13	-	40
6	38	35	7	80
7	109	11	-	120
8	142	18	-	160
9	95	25	-	120
TOTAL	1,021	252	7	1,280
% OF TOTAL	80%	20%	1%	100%

1/ Based on Table 1. Planimetry by Bureau of Land Management. Legal description of land and owner name corresponding to landowner number available at Dickinson District Office.

TABLE 3
AGRICULTURAL LAND USE ON THE SAKAKAWEA TRACT

Land Use:	Tract Acres	Average Production Per Acre 1/	Total Annual Production
Cropland	663	28.7 bu.	19,028 bu.
Hayland	94	1.95 tons	183 tons
Range	228	.6 AUMs	137 AUMs
Other	13	1.95 tons	25 tons
Fallow	362	n/a	n/a
Total	1,360	n/a	n/a

1/ Crop : wheat equivalent bu./acre
Hayland: tons/acre of hay
Range : AUMs/acre
Other : tons/acre of hay equivalent

Groundwater quality is typically a sodium sulfate bicarbonate type. Groundwater is used for domestic, stockwatering and municipal purposes. There are about 9 farmsteads in and surrounding this tract. Assuming an average of one and one half wells per farmstead, there are approximately 14 rural water wells, plus four city wells in Garrison and an undetermined number of other private wells in the town of Garrison. Most of the rural wells located in the tract are probably finished in lignite or sand beds close to the lignite. Most of the private wells in Garrison and three of the city wells are finished in the Garrison aquifer. The other city well is finished in the Fort Union formation.

VEGETATION AND AGRICULTURAL PRODUCTION

The Sakakawea tract is extensively used for agricultural purposes. Dryland farming methods, most notably alternate year summer fallow-cropping rotations, are widely practiced in the area. Twenty-seven percent or 362 acres is fallowed each year (Table 3).

Small grains such as durum, spring wheat, oats, sunflowers, winter wheat, flax, barley, rye, and corn (in descending order of acreage grown) are grown on 49 percent (663 acres) of the tract. Wheat yields average 28.7 bushels per acre. Much of the cropland production, especially the wheat portion, is sold as a cash crop. Oats, barley, and corn also are used as feed grains in livestock operations.

Seven percent (94 acres) of the tract is used for growing hay for use in overwinter livestock feeding. Approximately 1.95 tons of hay are produced per acre.

Seventeen percent (228 acres) is rangeland and pastureland. Rangeland produces about .6 Animal Unit Months (AUM) per acre. An AUM is the amount of forage needed to support a cow/calf for one month. Beef cattle are the predominant kind of livestock (North Dakota Crop and Livestock Reporting Service, 1980). There are also some other livestock.

Except for reseeded rangeland, the rangeland is in the widespread Mixed Grass Prairie type (Shaver, J.C. 1977). This includes species such as needle-and-thread, little bluestem, prairie sandreed, western wheatgrass, blue grama, side-oats grama, plainsmuhly, sedges, snowberry, fringed sagewort, and silver sage.

No threatened or endangered plant species as published on the 1980 federal list have been identified within the tract.

There are 7 operators and operator partnerships in the tract (Table 4). Operations range in size from 40 acres to 400 acres inside the tract and from 240 acres to 2,360 acres in total for the total operations.

Agriculture in the area includes crop operations, livestock operations, and mixtures of both. Most operations in the area include a balance between crops and livestock.

Approximately two-thirds of the operations have less than 25 percent of their lands within the tract while none have more than 57 percent of their acreage within the tract. Overall, the tract covers 22 percent of the acreage of the operations involved.

Forty-seven percent of the acreage within the tract is farmed by lessees, or operators who do not own the land. Fifty-three percent is farmed by owner/operators.

TABLE 4
FARM/RANCH OPERATIONS - SAKAKAWEA TRACT

	INSIDE COAL TRACT (ACRES)							OUTSIDE COAL TRACTS (ACRES)							
OPERATOR	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT
1	104	0	49	47	0	200	60	389	69	368	139	0	965	1165	17
2	19	0	1	19	1	40	100	272	28	197	221	0	720	760	5
3	255	5	28	112	0	400	10	178	0	158	79	0	415	815	44
4	44	39	38	39	0	160	0	57	4	10	44	0	120	280	57
5	90	28	60	90	12	280	100	723	159	616	582	0	2085	2360	12
6	86	14	6	14	0	120	0	59	16	35	10	0	120	240	50
7	65	8	46	41	0	160	100	199	156	324	125	0	480	640	25
TOTAL	663	94	228	362	13	1360	47	1777	432	1708	1200	0	4900	6260	22

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

Land use within the tract area is agricultural as described in other sections of this report. The tract also includes State Highway 37 running east and west through the north third of the tract, in addition, there are minor county roads and local utility lines.

The immediate vicinity includes an abandoned mine to the east, the town of Garrison to the West and Lake Sakakawea to the south.

RECREATION

Hunting of a variety of species (deer, upland game birds, waterfowl) is the main recreational opportunity offered to the public on the tract. This opportunity, while significant to local people, has limited attraction to people outside the immediate vicinity of the proposed mining.

The community of Garrison, North Dakota offers recreational opportunities in the general vicinity of the tract. Ball diamonds, parks, a swimming pool along with golf, tennis and gymnasium facilities offer adequate opportunities at this time. Lake Sakakawea, south of the tract, offers state and federal recreational opportunities.

AESTHETICS

The tract area is rustic in character, divided into fields which vary in appearance through the agricultural and seasonal cycles. The landscape is, therefore, highly variable. Roughly half the area is grazed rangeland. These areas are more stable in appearance.

The tract area is not a dominant part of the view from the town of Garrison to the west but is highly visible from State Highway 37.

The area is aesthetically attractive and has high visual quality but is not particularly valued as scenery because the type of landscape is very common in the region and nothing in the tract area differentiates it from the miles of surrounding landscape.

WILDLIFE

This coal mining unit is in an area of glaciated topography. There is a southerly drainage into the old Missouri River (Garrison reservoir) from the area. Wetlands density is high, even though the area is heavily farmed. The unnamed drainageway through the unit has some excellent native woodlands along it, and is bounded along much of the way by native prairie.

Wetlands provide essential habitat for about 22 wildlife species. The whooping crane is a federally endangered species, and commonly uses this area during annual migrations. The three essential habitats, woodlands, wetlands, and interspersed native prairie, provide essential habitat for 31 species (Table 5).

TABLE 5
WILDLIFE HABITAT AND SPECIES

Woodlands	Wetlands	Native Prairie	Agriculturally Disturbed
*Sharptail Grouse	*Hungarian Partridge	*Sharptail	Sharptail
*Hungarian Partridge	Mourning Dove	Hungarian Partridge	Hungarian Partridge
*Mourning Dove	*Pheasant	Mourning Dove	Mourning Dove
*Pheasant	*Mallard	*Whooping Crane	Pheasant
*Merlin	*Gadwall	*Merlin	Whooping Crane
*Swainson's Hawk	*Whooping Crane	Swainson's Hawk	Swainson's Hawk
Marsh Hawk	*Pintail	Marsh Hawk	Marsh Hawk
Ferruginous Hawk	*Greenwing teal	*Burrowing Owl	Ferruginous Hawk
*Loggerhead Shrike	*Widgeon	*Ferruginous Hawk	Whitetailed Deer
*Whitetailed Deer	*Shoveler	Loggerhead Shrike	Red Fox
*Mule Deer	*Redhead	Whitetailed Deer	Badger
Mink	*Canvasback	*Mule Deer	No. Swift Fox
Beaver	*Ruddy	*Antelope	
Red Fox	*Sandhill Crane	Mink	
Badger	*Swainson's Hawk	Red Fox	
No. Swift Fox	*Marsh Hawk	*Badger	
*Bobcat	*Sprague's Pipit	*No. Swift Fox	
	*Whitetailed Deer	Bobcat	
	*Muskrat		
	*Mink		
	*Beaver		
	*Red Fox		
	Badger		

*Essential habitat for species

Woodlands, wetlands, and interspersed native prairie comprise about 20 percent of the 1,160 acres photo-interpreted while agriculturally disturbed lands make up the remaining 80 percent.

The interspersion of woodlands, wetlands and native prairie provides the greatest amount of edge and habitat which supports the greatest wildlife species diversity and highest populations as compared to the wildlife carrying capacity of individual woodlands, wetlands, or native prairie units. The remnant mixed habitats are the result of 60-70 years of intensive farming of all suitable farming land, with limited exception. These residual wildlife habitats are the best of the limited habitats in the area.

Wetlands, specifically prairie potholes, are the most productive wildlife habitat in North Dakota.

All remaining native grasslands represent precious relics of the original prairie ecosystem. They evolved during thousands of years and, once destroyed, cannot be exactly duplicated by man. The rate of native prairie loss in North Dakota has been tremendous, and unplowed prairie is only 20 percent of the original total.

CULTURAL RESOURCES

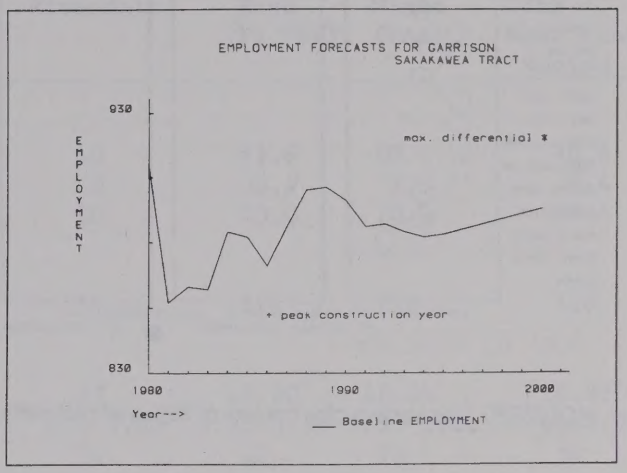
No systematic survey has been conducted on this tract and no cultural resources information has been collected in the general vicinity. It is likely that any sites found would be task specific and exploitative in nature (i.e., bison kill sites; lithic scatters of varying size, function and density; seasonal and long-term habitation sites).

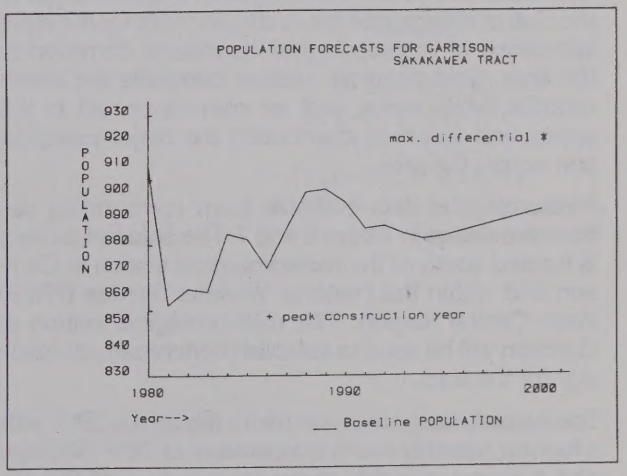
The dominant human use of the area in the historic period has been farming. Stock raising has been a minor use. Most evidence of historic activity is oriented toward farming activity. This activity, which continues to the present time, has possibly eradicated cultural resources from earlier times.

ECONOMICS AND SOCIAL CONDITIONS

Future population and employment levels in Garrison, without the leasing of federal coal are expected to remain relatively stable until the early 1900's and then gradually decline through the year 2000 as shown in Figure 1 (Mountain West Research 1981).

FIGURE 1

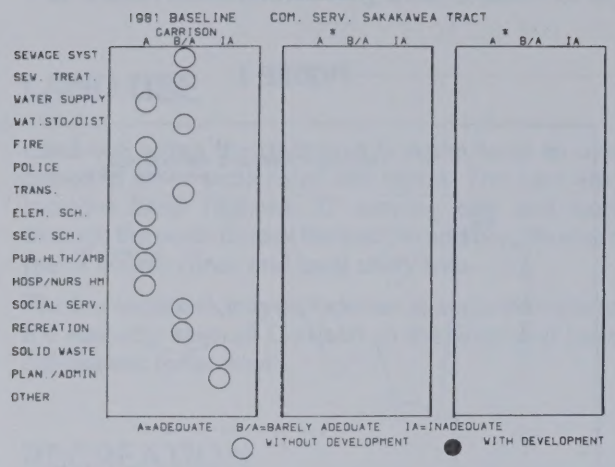




SOURCE: Respective city/county or regional planners.

At the present time (1981) community services in Garrison are generally adequate (Figure 2). However, planning and administration and solid waste are considered to be inadequate (McLean County Meeting 1981). The mayor has indicated that funds have been obtained for a sanitary landfill. This will alleviate the current solid waste problem.

FIGURE 2



SOURCE: Respective city/county or regional planners.

CLIMATE AND AIR QUALITY

The climate of western North Dakota is typically continental, characterized by variable temperature and precipitation. The predominant pressure systems, out of the Gulf of Mexico and the Arctic, account for the rapid alterations of meteorological conditions common to the area. Cold polar air masses dominate the winter months, while moist Gulf air masses prevail in the spring and summer, distributing the major precipitation across the area.

Meteorological data available from surrounding stations are shown in Tables 6 and 7. The Sakakawea tract is located south of the meteorological station at Garrison and within the National Weather Service (NWS) West Central Region. The meteorological station at Garrison will be used to establish benchmark climatology for the tract.

The annual mean temperature for the area is 39°F with a highest monthly mean temperature of 70°F (in July), and a lowest monthly mean temperature of 8°F (in January). The average growing season is approximately 123 days; the last spring freeze generally occurs during the third week of May, while the first fall freeze generally occurs during the third week of September (Ramirez, J.M. and T. Method 1976).

Precipitation in the area occurs predominately in the late spring and early summer (May to July). Annual precipitation averages 15.86 inches at Garrison, and 16.91 inches through the NWS West Central Region. The average annual snowfall at the Garrison station is 24 inches.

TABLE 7
REPRESENTATIVE REGIONAL METEOROLOGICAL DATA

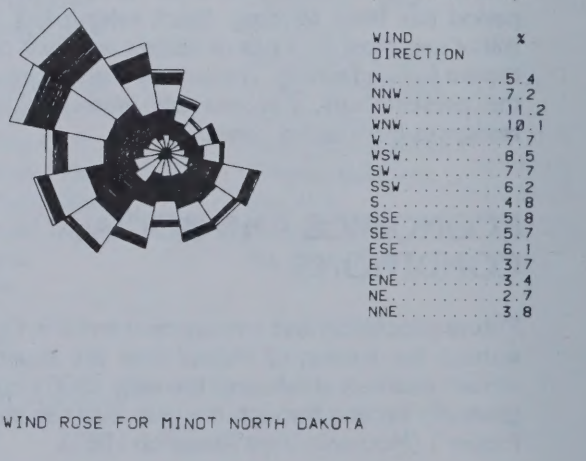
	Regional Values
Humidity (Annual Average), %	40-50
Lake Evaporation (Annual Avg.), in.	50-55
Extreme Weather	
Thunderstorms, days/year	30
Tornadoes, sightings/year	rare
Hail, days/year	2-4
Maximum recorded wind speed, mph*	72
Inversion Frequency (base 1500 ft.), %	
Annual	35
Seasonal Range	30-50
Mixing Height, ft.	
Mean Annual Morning	984-1312
Mean Annual Afternoon	4921-5249
Mean Seasonal Afternoon Range	1968-7874

*Recorded at Bismarck, North Dakota

Sources:
Brum, L.J., J.W. Enz and J.M. Ramirez 1978.
Jensen, R.E. 1974.
Ramirez, J.M. and T. Method 1976.
U.S. Department of Commerce 1974.

Wind data used for this analysis were obtained from the Dickinson climatological station, the nearest station to the tract with data suitable for input into the dispersion model. The wind rose in Figure 3 represents a summary of this data. Winds prevail from the W to NW at Minot (29 percent frequency of occurrence). Wind speeds average 12.7 mph and exceed 11.5 mph 46 percent of the time.

FIGURE 3



WIND ROSE FOR MINOT NORTH DAKOTA

TABLE 6*
METEOROLOGICAL DATA FOR SELECTED SITES

Parameter	Garrison	Max	Riverdale	Raub (12 SSW)	Minot (FAA)	NWS West Central Region
Temperature, °F						
$\bar{X}$ annual, °F	39	38.7	40	41.6	40.1	40.6
$\bar{X}$ monthly low (Jan)	8	5.5	9	9.4	7.9	8.4
$\bar{X}$ monthly high (July)	70	68.5	70	70.0	70.9	69.4
Average growing season (temp. 32° F), days	123	126	134	114	132	120
Precipitation, in.						
Annual average	15.86	17.67	17	14.80	17.24	16.91
Monthly range	0.45-3.55	0.46-4.04	0.4-3.4	0.31-3.55	0.53-3.66	0.40-3.92
Annual snowfall	24	30	24	26	35	30
Annual stability, (by class)						
% occurrence						
Class A, B, C					10.6	
Class D					66.6	
Class E, F					22.8	
Wind direction, (%)					W-NW(29)	
Wind speed, mph (% of time)					0-3.5 (5.9)	
					3.6-6.9 (15.7)	
					7-11.5 (32.5)	
					11.6-18.4 (29.5)	
					18.5-24 (12.5)	
					>24 (4.0)	
Average wind speed, mph					12.7	

*SOURCES:
Jensen, R. E. 1972.
North Dakota Crop & Livestock Reporting Service 1980.
Ramirez, J. M. and T. Method 1976.
Ramirez, J. M. 1972.
Ramirez, J. M. 1973.
U.S. Department of Commerce 1948-1974; 1973; 1974; 1977; 1979a; 1979b.

Although the terrain offers only limited obstruction to the dispersion of pollutants, the area experiences frequent temperature inversions, which reduce mixing heights and tend to concentrate pollutants (Brum L. J., J. W. Enz and J. M. Ramirez 1978).

Table 8 presents some of the available air monitoring data from ambient air monitoring stations in the general vicinity. Recorded annual geometric mean concentrations for total suspended particulates (TSP) from area rural locations have ranged from 15 ug/m^3 (at Garrison) to 32 ug/m^3 (at Beulah). The annual geometric mean concentration of TSP at the local privately operated impact source monitoring stations ranged from 21 ug/m^3 (at Falkirk Mine) to 44 ug/m^3 (at Coal Creek). For the purpose of the following computer analyses, the background rural TSP levels will be set at 24 ug/m^3 for the annual level and 100 ug/m^3 for the 24-hour level.

Three Class I areas, the North and South Units of Theodore Roosevelt National Park and the Lostwoods National Wilderness Area, fall within the potential impact range of the proposed tract and associated developments. Based on 1979 air quality computer modeling estimates by the North Dakota State Department of Health, the allotted 24-hour SO_2 increment for the South Unit of the Park is consumed, or nearly consumed.

TABLE 8
WEST CENTRAL NORTH DAKOTA AIR MONITORING DATA*

Monitoring Site	Year	Parameter	No. Observations	Max. Observation (ug/m^3)	2nd Max. Observation (ug/m^3)	Annual Geom. Mean (ug/m^3)	Annual Arith. Mean (ug/m^3)
			State-Operated Sites				
Garrison (rural)	76	TSP	58	176	105	28	39
	77	TSP	58	245	132	23	33
	78	TSP	54	69	58	16	20
	79	TSP	36	47	47	15	20
Parshall	76	TSP	55	76	67	19	26
	77	TSP	53	109	91	20	26
	78	TSP	35	77	62	17	24
Beulah (rural)	74	TSP	10	488	47	26	69
	75	TSP	39	171	141	24	37
	76	TSP	51	81	61	24	29
	77	TSP	58	224	73	24	31
	78	TSP	52	288	258	32	52
	79	TSP	28	82	78	22	28
Stanton (rural)	76	TSP	61	150	104	31	39
	77	TSP	60	237	90	24	32
	78	TSP	58	104	67	19	24
	79	TSP	42	90	80	19	25
			Privately-Operated Impact Source Monitoring Sites:				
Coal Creek #1	79	TSP	37	242	190	37	56
		SO_2	8106	162	136	<5	<5
	80	TSP	58	413	232	36	57
		SO_2	7681	212	175	<5	<5
Coal Creek #2	79	TSP	37	404	229	44	76
		SO_2	7710	423	394	<5	<5
	80	TSP	61	533	299	40	63
		SO_2	8172	89	89	<5	<5
Coal Creek #3	79	TSP	37	115	105	35	44
		SO_2	6446	185	120	<5	<5
	80	TSP	60	578	222	35	52
		SO_2	7994	358	243	<5	<5
Falkirk #1	79	TSP	43	246	110	24	37
	80	TSP	34	161	126	35	48
Falkirk #2	79	TSP	46	139	99	21	32
	80	TSP	36	94	92	23	32
Falkirk #3	79	TSP	46	196	115	29	42
	80	TSP	37	151	149	38	52
Falkirk #4	79	TSP	43	113	97	24	36
	80	TSP	38	132	85	26	35

*SOURCE - North Dakota State Department of Health

CHAPTER III
ENVIRONMENTAL CONSEQUENCES

TOPOGRAPHY

The natural contour of the land would be modified during surface mining. Although most would be returned to approximatly the original contour, difference in detail would remain, including drainage patterns and the final slopes of highwalls.

In general, the reshaped ground would not be steep enough to cause slope failures and related hazards but until natural vegetation is reestablished, accelerated erosion resulting in unsightly scars would be a potential problem.

GEOLOGY AND MINERALS

The major impact of this alternative would be removal of 7.9 million tons of lignite. There is a minor chance of conflict between oil production and coal production from the tract. Coal leasing would delay exploration for oil and gas possibly for the life of the mine.

SOILS AND RECLAMATION POTENTIAL

The types of impacts affecting the soil resource in this area have previously been discussed in Bureau of Land Management planning documents and the Draft West Central North Dakota Regional Environmental Impact Study. Briefly, the basic impacts if mining proceeds are the disruption of the present soil bodies with temporary loss of productivity and problems with erosion, compaction, and instability.

Soil erosion and compaction would not be new to the area because of the dryland agricultural activity that already exists. About 49 percent of the tract is annually cropped with 26 percent of the total tract left bare of protective cover, due to summer fallowing. Existing erosion and compaction impacts would therefore continue with or without the presence of an active mine. This should not cause significant detrimental effects to the soil resource if the required stipulations are followed.

Some instability problems usually appear with the onset of reclamation. Area-wide settling, localized subsidence or collapse, and underground erosion called piping may occur (Groenwald, 1980). However, if the stipulations covering the handling of soils and overburden during surface mining operations are enforced these impacts should be minimal. The gentle slopes over most of the area would aid in the workability of material and make corrective measures on problems spots easier to carry out. Also, overburden with large amounts of glacial till is not usually as susceptible to instability problems as is that from clayey, sodic shale which is not common in the tract.

The soils are lost to the production of grass, forage, and grain over the short-term use (about 10 years for each annual disturbance of 34 acres) of the tract for coal mining. This loss is occurring only on the active portion of the mine at any peak mining time. Once in full operation, the total tract area out of production in any given year is estimated at 340 acres. Soils will be continuously replaced in mined out areas and brought back into production during the life of the mine (40 years).

Preliminary indications from completed and ongoing research by such agencies as the Science and Education Administartion—Agricultural Research of Mandan, North Dakota and North Dakota State University—Agricultural Experiment Station of Fargo are that agricultural productivity of mined land can be restored. Much depends, however, on the planning and implementation of a concerted reclamation effort (Power, 1974).

The chance for successful return of agricultural productivity in this tract is high. Soils Table 2 in Chapter II indicates that individual landowners have ample supplies of soil rated good and fair for use as cover soil material in surface-mine reclamation. Productivity might even be increased with reclamation by leaving slopes more gentle where strong slopes now exist and averaging soil over the landowner's holdings.

HYDROLOGY

The wetlands located on this tract would be destroyed during mining. The wetlands in this area are not dependent upon groundwater as recharge. However, the local groundwater system is dependent upon the wetlands for recharge. In order to maintain post-mining recharge similar to the premining system, these wetlands must be re-created.

The mineable lignite in this tract is probably the most commonly used local groundwater source. Sand beds in the Tongue River member of the Fort Union formation near the lignite are also used. The lignite aquifers and any sand bed aquifers above or immediately below the lignite would be destroyed as this area is mined. While the mine pits are open, water levels in the disrupted aquifers would be drawn down in the surrounding area. The distance from an open pit that this drawdown would occur and the amount of drawdown would depend upon the local aquifer characteristics.

Wells that are finished in the disturbance zone within the tract would experience a water level drawdown. The Garrison municipal wells and other wells that are finished in the buried glacial meltwater valley to the southwest of the tract would not be significantly impacted. Once the overburden is replaced in the pit, the drawdown stress would begin to subside and approach a post-mining equilibrium. The flow patterns of groundwater would still be different than under premining conditions. Generally water would not be as available from the replaced overburden under post-mining conditions. The lignite sand and buried valleys in the area surrounding the tract would still be viable aquifers. Water would move between these areas and the replaced overburden as part of the new hydrogeologic system.

The physical disturbance caused by a mining action can also result in changes in the chemical quality of the local groundwater. Increases in sodium, sulfates and total dissolved solids concentrations have been reported by Groenwald (1979 and 1980) at other mines in North Dakota with similar overburden. These changes in water quality were variable but dependent upon overburden characteristics and reclamation practices. The quality of water in the replaced overburden would probably be degraded.

The mining company would be responsible for the replacement of any degraded water supply. Replacing water sources would mean drilling to deeper aquifer levels. There is not sufficient information to describe exactly how deep a replacement supply is, but deeper aquifers that would not be impacted by mining are known to be in the area. Another alternative would be to use water from Lake Sakakawea.

Associated with these deeper replacement wells would be higher operating and maintenance costs to the local water users. Also any additional wells needed in the future after the mining company has fulfilled its replacement obligations and left the area would cost more to drill. The cost of these additional wells would not be paid by the mining company.

VEGETATION AND AGRICULTURAL PRODUCTION

The proposed action would progressively remove an average of 34 acres of the total tract area per year from its current uses. The major use of these lands is agricultural production. The first land taken out of agricultural operations, except for the plant site and ancillary facilities, would occur in the first year of mining. The time period of removal from agricultural production would be the time spent in mining and land reclamation. The entire tract would be progressively mined over a 40 year period.

Mining of any one location would be for one to five years depending on the type of mining. Land reconstruction to premining levels of agricultural production would require a total of approximately ten years. The land would be placed into the premining type of agricultural production or other premining uses that the landowner and Public Service Commission agree upon (wildlife habitat, woodlands, or rights-of-way). Vegetation reestablishment would occur during the first appropriate season after grading to topography and replacing topsoil.

The company would be under bond for at least ten years, or as long as necessary to prove, at a 90 percent confidence level, that agricultural productive capacity has been restored to equal or better than it was before mining (Public Service Commission, Reclamation Department, 1980). Reclamation research by such agencies as the Science Education Administration—Agricultural Research Service of Mandan, and North Dakota State University—Agricultural Experiment Station of Fargo, indicates that some degree of optimism for the restoration of land to agricultural production is justified, although there is no certainty as to how long it would be before all mined land would be judged as fully restored as the law requires.

The leasing development alternative would have a significant short-term impact on individual agricultural operations, which include land over federal coal. By the end of the 40-year mine life, 1,360 acres of the tract would be disturbed, in addition to 160 surface acres used for existing mine facilities.

An average of 17 acres of cropland, excluding summer fallow, would be removed from production each year. This would be an average annual loss of 488 bushels of wheat. This 17 acres of cropland would be out of production ten years with a maximum loss of 4,850 bushels of wheat annually.

Peak mining year disturbance of 24 acres of hayland on operations with land over federal coal would result in an annual loss of 47 tons of hay production.

An average of 6 acres of rangeland, on operations which include land over federal coal, would also be removed from production each year, resulting in an average loss of 4 AUMs. This 6 acres of rangeland would be out of production ten to fifteen years with a maximum of 57 acres out of production in any one peak mining year, resulting in a maximum annual loss of 34 AUMs.

Regionally, these losses would not pose significant reductions in area agricultural production.

Time constraints necessitated the Bureau of Land Management's preparing agricultural data collection on the preliminary logical mining unit instead of the later final logical mining unit. The data may not completely represent the logical mining unit in its final form.

In the reestablished native-type range it is likely that some introduced species would be used. The laws require that introduced species be of the same seasonal variety and of equal or superior utility as the native species. Some of the more sensitive plants (for cropland, woodland, or rangeland use) may have difficulty in becoming established on some of the less suitable soils.

Forbs, woody plants, and trees (woodlands) must be reestablished along with grasses.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

Agricultural use would be displaced by active mining and reclamation in the short-term: up to ten years would be required before use could resume on most of the tract.

Population increases due to mining activity would affect nearby communities through demand for residential and commercial expansion. This expansion should be considered long-term and irreversible.

Roadways and utilities would either be relocated or bypassed creating some minor inconvenience particularly if they are relocated.

RECREATION

Habitat destruction and the resulting loss of wildlife species would damage recreational hunting. From the recreation perspective, it is likely the loss would be manageable.

Social and economic studies have documented demographic changes resulting from mining that would stress communities in the vicinity of the tract. This stress would be felt on the available recreation facilities in the communities. Outside of the communities, increased pressure would be seen on private and public land because of recreational opportunities lost to mine related impacts.

AESTHETICS

The tract area is viewed from State Highway 37 but is not visible in most views from the town of Garrison. The area is relatively flat. Few views from the highway would be impeded: mining activity would be highly visible.

The appearance of mining activity, while not particularly attractive, should surprise no one. The presence of mining in this area would likely be considered as a normal part of activity on the land. Progressive mining and reclamation implies that disturbance to the land would be limited to a relatively small area at any given time. The impact from an aesthetic standpoint, provided State and Federal law is complied with, can be considered short-term and reversible.

WILDLIFE

Coal mining and attendent action would severely disrupt and destroy significant wetlands habitat for sensitive and many other species of wildlife in the area. On-site effect to wildlife resources would be degradation and loss of the three essential habitats; wetlands, native woodlands, and remnant interspersed native prairie which in composite provide habitat for approximately 31 sensitive species. Agriculturally disturbed areas are of low wildlife habitat value, but do provide spring and fall feeding and loafing habitat for migratory birds. The areas identified on Map 3, (Chapter 1) are those which represent the highest sensitive wildlife habitats.

There would be a significant area loss to wildlife resources if mining occurs in these essential habitats and they are not replaced in full (compensation), or are converted to farmland.

Mobile wildlife such as birds and large mammals may shift about the habitat losses to some degree, but nonmobile species such as reptiles and amphibians would be destroyed. The very limited availability and disruption of riparin woodlands and wetlands would restrict, and in many cases exclude, the accommodation of disturbed mobile wildlife.

Noise, presence of humans, heavy equipment, dust and affiliated disturbances cumulatively may cause wildlife to vacate unmined habitats and may preclude adoption by wildlife of those rehabilitated areas until the disturbances are eliminated. This may be for the life of the mine and rehabilitation period, which may be as long as 20 or more years.

Increased human populations resulting from mine development and operations generally reduce wildlife populations and habitat locally and offsite by poaching, road kills, increased legal harvest, and disturbance of reproductive and migratory periods and habitats. Additional reductions may be due to harassment by recreationists, feral and uncontrolled cats and dogs, and degradation and complete loss of habitat due to housing development, shopping centers, waste treatment plants, and similiar urban development. The problem is compounded in areas where shift changes of workers coincide with feeding periods, especially big game. The same would probably occur in this area.

Actions to mitigate these impacts available to entities other than BLM, would be to provide mass transportation of workers and adjust the times of shift changes which would greatly reduce poaching. This has been used successfully in other mining areas. Providing funds for the North Dakota Game and Fish Department for increased law enforcement and adoption of a poaching clause in union contracts would also help.

Successful reclamation of native woodlands and natural wetlands such as "potholes" and riverine wetlands has not been demonstrated. Native prairie has not been successfully reclaimed either, although some prairie plowed about 70 years ago and since left undisturbed shows some evidence of native plant species reestablishment.

Concurrent reclamation of lost wildlife habitat within 12 to 18 months after mining may reduce a few of the lessor negative wildlife impacts. However, disruption or loss of any of the larger wetlands and riparian woodlands is expected to become a permanent loss.

At present there is no data to suggest that natural, biologically viable wetlands (e.g., potholes) can be recreated from mine spoil in this country. It would be most productive and conservative to eliminate mining from the larger wetlands (e.g., 1/2 acre and greater) thereby retaining the critical soils structure of the wetlands and eliminating the extended delay proposed for wetlands recreation attempts. Destruction of natural viable wetlands by strip mining under the present state of biological and hydrological knowledge would be an irretrievable committment of wildlife resources.

An interagency team of wildlife biologists from the North Dakota Game and Fish Department, U.S. Fish and Wildlife Service and Bureau of Land Management have identified and recommended areas for the application of unsuitability criteria (Map 3, Chapter I). Formal recommendations have been received by BLM from the other agencies. Joint agreements between the agencies and final decisions on unsuitability, exemptions (such as producing leases), and exceptions will be completed in August, 1981.

CULTURAL RESOURCES

All cultural resources within the tract boundaries are subject to direct and indirect impacts. Direct impacts are those that result from ground disturbance activities and can result in damage and destruction to sites, artifacts, their environmental context and the data they contain.

Sites not directly impacted by earth disturbance may be impacted as a result of the earth disturbance. Secondary impacts can include vandalism increased by improved access, loss as a result of erosion or degradation resulting from disruption of natural setting.

In the event of lease, stipulations covering cultural resources would have to be developed. These stipulations would have to treat both recorded and unrecorded sites. They would also have to require management plans for cultural resources that detail mitigation plans for each site to be impacted. As in any cultural resources mitigation, preservation alternatives are preferred. If these options are not viable, then scientific data recovery programs would have to be developed.

ECONOMIC AND SOCIAL CONDITIONS

Since the Sakakawea Tract is a Small Business Tract, work force requirements would be quite small. The U.S. Geological Survey estimated the construction work force at 50 and the full operations work force at 20.

A study of energy related construction workers in Mercer County between 1978 and 1980 by the Inter-Industry Technical Assistance Team (ITAT) found that an average of 62 percent of the energy project construction workers relocate to the job site area in response to employment opportunities. Assuming this to be the case with the Sakakawea coal tract, 31 of the 50 mine construction workers would relocate to the area in order to work at the mine. The other 19 workers would already be living within commuting distance of the coal tract.

The ITAT study also found that the average family size for the relocating construction workers was 1.63 (January 1980). Applying this figure to the 31 non-local workers would result in an area-wide population increase of 51 people. The ITAT study found that 62.4 percent of the construction workers relocating to this area resided in Beulah, the closest town to the projects (January 1980). The rest of the non-local workers resided primarily in other communities within Mercer County or in adjacent counties. Assuming this to be the case with the Sakakwea tract, 32 individuals would relocate in Garrison as a direct result of mine construction.

Mountain West Research forcasts population in Garrison to be 1,754 in 1985, the estimated start date of mine construction. The additional 32 individuals directly related to mine construction would result in a 2 percent population increase in Garrison. The mayor of Garrison has indicated that low levels of population growth such as this would have no significant impact on community services (McLean County Meeting 1981).

Due to smaller employment requirements, population increases associated with mine operations would be proportionally smaller than those discussed with mine construction.

Changes in regional personal income from tract development are expected to be insignificant through the year 2000. The communities in which the workers and their families reside would experience some increases in economic activity as a result of employee payroll expenditure and through company expenditures for goods and services during the construction and operation phases.

Technical reports are available which discuss the methodology used in the economic or social anaysis.

NET ENERGY ANALYSIS

A net energy analysis was calculated using the guidance contained in a BLM Washington Office Information Memo 80- 640, July 17, 1980. Approximately 37.7 British thermal units (Btus) would be expended to produce a pound of coal. That pound of coal, in turn, would produce about 6,565 Btus. The ratio of energy produced to that expended is 174 Btus/1 Btu.

CLIMATE AND AIR QUALITY

Impacts on climate from the proposed action cannot be addressed specifically. This is due to a lack of technical information and research work on the topic of potential impacts on climate. However, general climatic influences applicable to the proposed development can be discussed.

The modification of surface contours and albedo due to redistribution of soils and removal of vegetation may produce slight localized changes in wind speed and direction, temperature, and humidity. Impacts associated with the increased particulate emissions could also alter local climatic conditions. Reclamation with reestablishment of vegetation and a stable landscape should largely mitigate these impacts over the long-term.

The methodology for determining the air quality impact of particulate emissions consists of: 1) obtaining mine profiles for the tract from BLM; 2) obtaining emission factors for individual surface coal mining operations; 3) using the mine profile and emission factors for calculation of total emissions; 4) entering the emission data into a modified climatological dispersion model (CDMQC) for prediction of ambient concentrations; and 5) comparing predicted concentrations to Federal and State Ambient Air Quality Standards and to Prevention of Significant Deterioration (PSD) increments. The air quality impact was analyzed for the proposed tract's peak production period.

Details about the CDMQC model, emission factors, and their application appear in the technical report (separate cover).

The results of the modeling analysis were plotted on an isopleth map. The predicted concentrations were then compared with applicable air quality standards. The 1970 Clean Air Act Amendments establish primary and secondary National Ambient Air Quality Standards (NAAQS). North Dakota established air quality standards in 1969. The present Federal and State ambient air quality standards are shown in Table 9.

All pollutant sources must be evaluated to determine if PSD regulations apply. Preliminary evaluations indicate that the proposed coal mine's product emissions (coal dust) would be less than 250 tons/year; therefore, the coal mine is not a PSD source. However, the State PSD regulations specify that if the fugitive dust emissions cause the total potential particulate emissions to be in excess of 250 tons/year, then the source consumes PSD increment (i.e., these sources do not have to meet PSD regulations, but, the emissions from these sources are counted against PSD increment). Table 10 shows Federal and State PSD standards.

During peak production of the mine an estimated 294 tons per year would be emitted, with the best available control technology applied. Fugitive dust sources would account for 98 percent of the peak production emissions.

Dispersion modeling was performed to predict particulate concentrations for comparison with State and National Ambient Air Quality Standards. Areas within the active mining area, such as the mine facilities, pit area, and reclamation areas, are not subject to these standards.

The isopleth lines on Figure 4 indicate annual average particulate concentrations that could result during peak production; the highest concentration at a location off the mine site could be 0.4 ug/m^3. This level does not exceed the allowable Class II PSD annual increment for particulates. With the estimated annual background concentration added (24 ug/m^3), the ambient level should not exceed State or Federal Ambient Air Quality Standards.

In addition to the annual particulate standard of 60 ug/m^3, North Dakota has a 24-hour standard of 150 ug/m^3 that cannot be exceeded more than once per year off the mine site. Figure 5 shows the predicted highest particulate concentrations for 24-hour averaging times, resulting from the proposed action. The predicted highest 24-hour values associated with the proposed action during peak production could be as high as 3 ug/m^3. This level does not exceed the allowable Class II PSD 24-hour increment for particulates. With the estimated 24-hour background concentration added (100 ug/m^3), the ambient level would be 103 ug/m^3. This level complies with the State and Federal Ambient Air Quality Standards. There is a possibility that the proposed action could violate State and Federal ambient TSP standards, but this is subject to the mine emissions and the corresponding background levels in the area.

Several small sources of gaseous pollutants are associated with surface coal mining operations.

During peak production, the relatively small gaseous emissions associated with the mining operations are not expected to violate air quality standards. Gaseous emissions for mining sources were not modeled because of their expected limited impacts to the air quality.

TABLE 9
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
TOTAL SUSPENDED PARTICULATES	Annual geo. mean conc.	60 ug/m^3	75 ug/m^3	60 ug/m^3	Annual geo. mean conc.
	Max. 24-hr. concentration not to be exceeded more than once per year	150 ug/m^3	260 ug/m^3	250 ug/m^3	Max. 24-hr. conc. not to be exceeded more than once per year
SETTLED PARTICULATES (Dustfall)	(At present there is no federal standards)			15 tons/ sq. mile	Max. 3-month arithmetic mean in residential areas
				30 tons/ sq. mile	Max. 3-month arithmetic mean in heavy industrial areas
COEFFICIENT OF HAZE	(At present there is no federal standard)			0.4 coh. per 1000 linear ft.	Max. annual geo. mean
SULFUR DIOXIDE	Annual arith. avg. conc.		.03 ppm (80 ug/m^3)	60 ug/m^3 (0.02 ppm)	Max. annual arithmetic mean
	Max. 24-hr. concentration not to be exceeded more than once per year		14 ppm (365 ug/m^3)	260 ug/m^3 (0.10 ppm)	Max. 24-hr. conc.
	Max. 3-hr. concentration not to be exceeded more than once per year	.50 ppm (1300 ug/m^3)		715 ug/m^3 (0.24 ppm)	Max. 1-hr. concentration
REACTIVE SULFUR (Sulfation)	(At present there is no federal standard)			0.24 mg SO_3/100 cm^2/day	Max. annual arithmetic mean
				0.50 mg SO_3/100 cm^2/day	Max. for a 1-month period
SUSPENDED SULFATE	(At present there is no federal standard)			4 ug/m^3	Max. annual arithmetic
				12 ug/m^3	Max. 24-hr. conc. not to be exceeded over 1 percent of the time
SULFURIC ACID MIST, SULFUR TRIOXIDE OR ANY COMBINATION THEREOF	(At present there is no federal standard)			4 ug/m^3	Max. annual arithmetic mean
				12 ug/m^3	Max. 24-hr. conc. not to be exceeded over 1 percent of the time
				30 ug/m^3	Max. 1-hr. concentration not to be exceeded over 1 percent of the time

TABLE 9 (cont.)
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
HYDROGEN SULFIDE	(At present there is no federal standard)			45 ug/m^3 (0.032 ppm)	Max. ½-hr. conc. not to be exceeded more than twice in any 5 consecutive days.
				75 ug/m^3 (0.054 ppm)	Max. ½-hr. conc. not to be exceeded over twice a year
CARBON MONOXIDE	Max. 3-hr. concentration not to be exceeded more than once per year	9 ppm (10 ug/m^3)	9 ppm (10 ug/m^3)	10 ug/m^3 (9 ppm)	Max. 3-hr. conc. not to be exceeded more than once per year
	Max. 1-hr. concentration not to be exceeded more than once per year	35 ppm (40 ug/m^3)	35 ppm (40 ug/m^3)	40 ug/m^3 (35 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
OZONE	Max. 1-hr. concentration not to be exceeded more than once per year	0.12 ppm (235 ug/m^3)	0.12 ppm (235 ug/m^3)	235 ug/m^3 (0.12 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
HYDROCARBONS (Less Meth.)	Max. 3-hr. concentration (6-9 a.m.) not to be exceeded more than once per year	.24 ppm (160 ug/m^3)	.24 ppm (160 ug/m^3)	160 ug/m^3 (0.24 ppm)	Max. 3-hr. conc. (6-9 a.m.) not to be exceeded more than once per year
NITROGEN DIOXIDE	Annual arithmetic avg. concentration	.05 ppm (100 ug/m^3)	.05 ppm (100 ug/m^3)	100 ug/m^3 (0.05 ppm)	Max. annual arithmetic mean
				200 ug/m^3 (0.10 ppm)	Max. 1-hr. conc. not to be exceeded over 1 percent of the time in any 3-month period
LEAD	Quarterly arithmetic mean		1.5 ug/m^3	1.5 ug/m^3	Quarterly arithmetic mean

Sources:

National Ambient Air Quality Standards. 1978.
North Dakota Air Pollution Regulations. 1978.

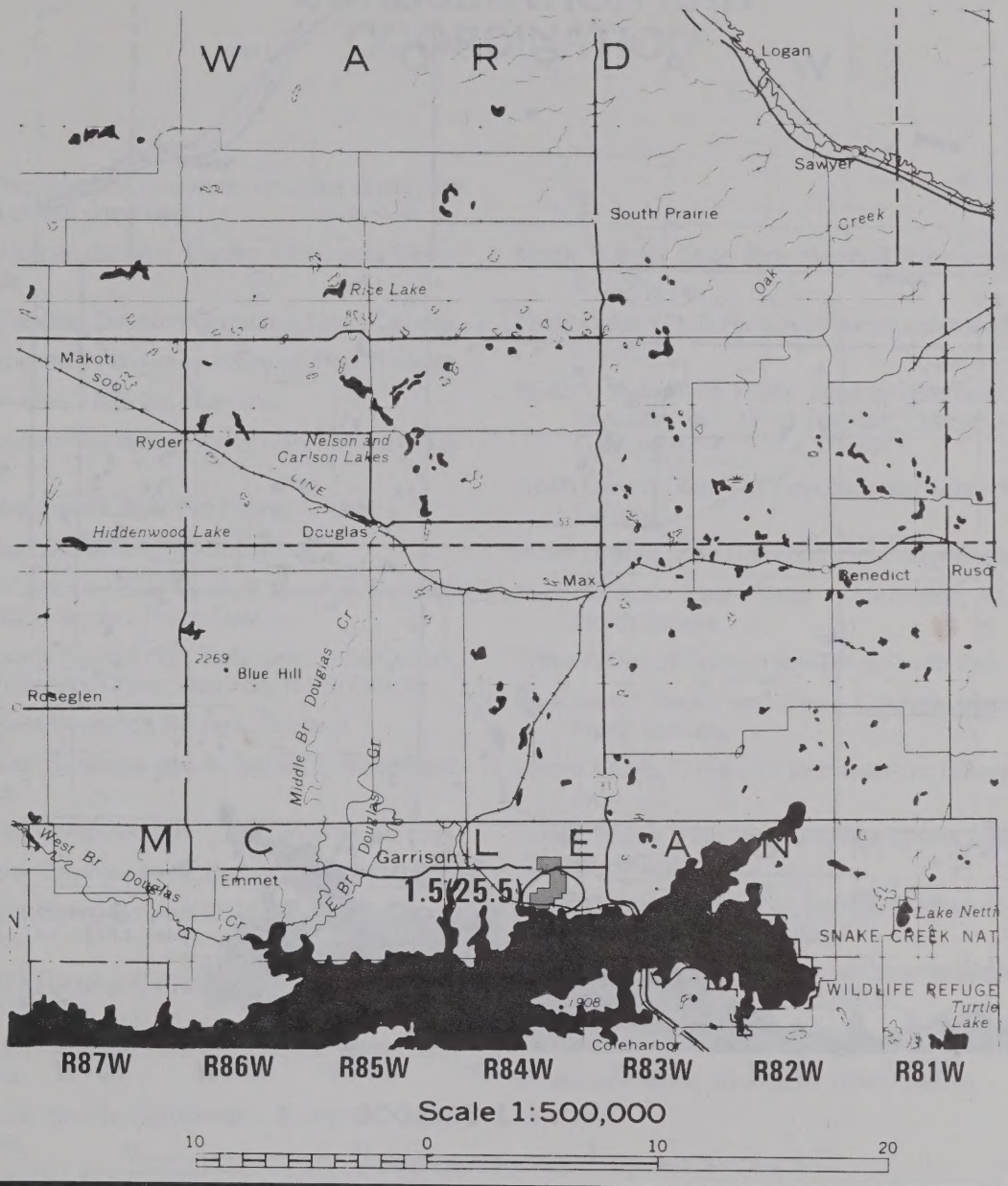
TABLE 10
FEDERAL AND STATE PSD STANDARDS

	Federal	State
Major Sources, subject to PSD review	100[1]	100[3]
(excludes fugitive dust emissions) (t/yr)	250[2]	250[4]
Major Sources, not subject to PSD review-counts against PSD increment	100[1]	100[3]
(considers fugitive dust emissions) (t/yr)	250[2]	250[4]
Deterioration Increments for Area Designations		
Particulates		
Class I		
annual geometric mean (ug/m^3)	5	5
24-hour maximum (ug/m^3)	10	10
Class II		
annual geometric mean (ug/m^3)	19	10
24-hour maximum (ug/m^3)	37	30
Class III		
annual geometric mean (ug/m^3)	37	37
24-hour maximum (ug/m^3)	75	75
Sulfur Dioxide		
Class I		
annual arithmetic mean (ug/m^3)	2	2
24-hour maximum (ug/m^3)	5	5
3-hour maximum (ug/m^3)	25	25
Class II		
annual arithmetic mean (ug/m^3)	20	15
24-hour maximum (ug/m^3)	91	91
3-hour maximum (ug/m^3)	512	512
Class III		
annual arithmetic mean (ug/m^3)	40	40
24-hour maximum (ug/m^3)	182	182
3-hour maximum (ug/m^3)	700	700

1. Listed sources; CFR Chapter 51:24
2. All other sources (includes coal mines); CFR Chapter 51:24
3. Listed sources; N.D.A.C. Chapter 33-15-15
4. All other sources (includes coal mines); N.D.A.C. Chapter 33-15-15

*SOURCES

Prevention of Significant Deterioration of Air Quality. 1978. Chapter 33-15-15 NDAC
Requirement for Preparation, Adaption and Submittal of Implementation Plan.
1978. Title 40 CFR, Part 51.



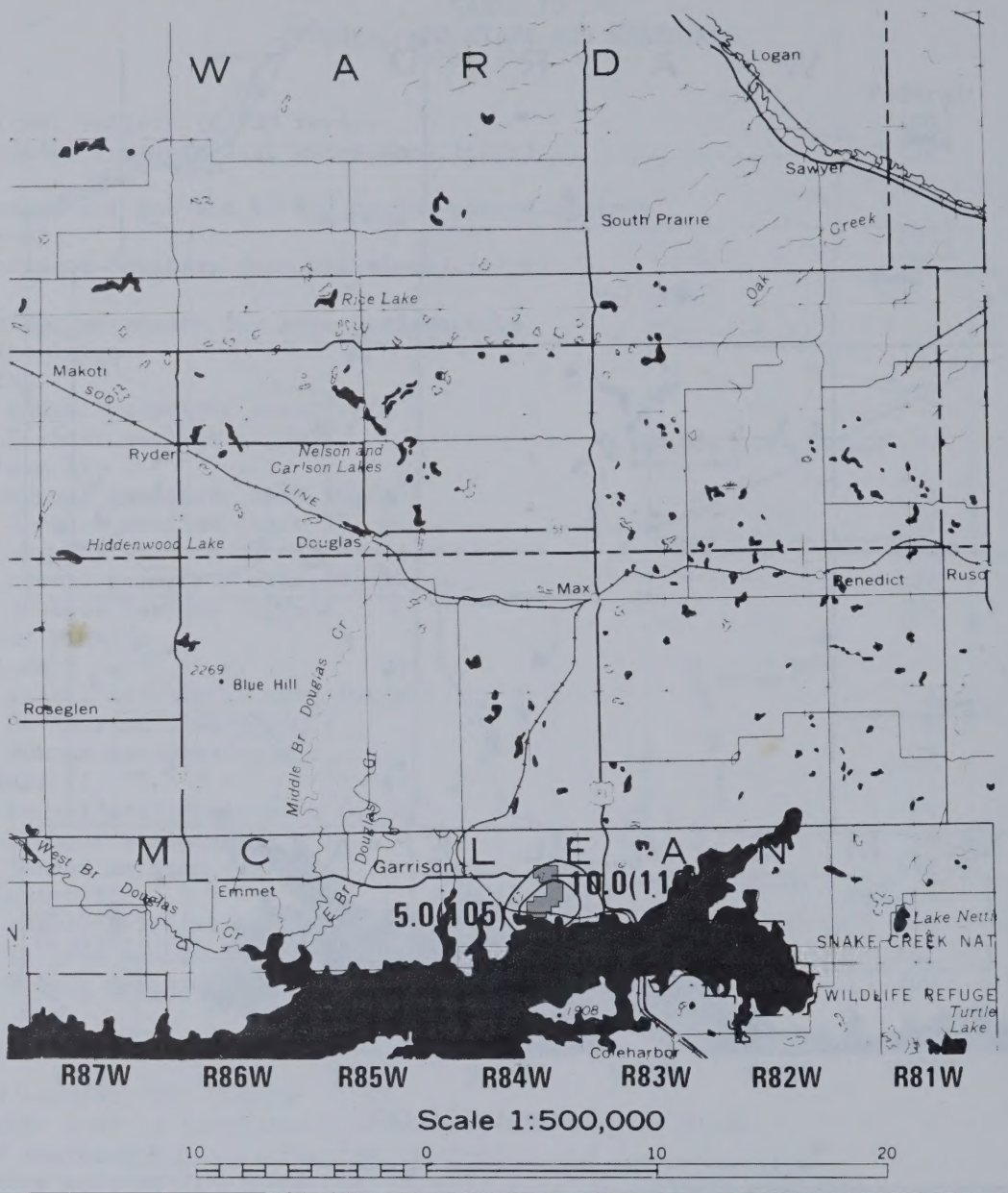
Sakakawea Tract

-N-

TSP Annual Average Concentration (ug/m^3) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 4



Sakakawea Tract

TSP Maximum 24-hour Concentration (ug/m^3) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 5

CHAPTER IV
CONSULTATION AND COORDINATION

The following organizations were consulted during the production of this document.

Badlands Human Service Center; Dickinson, North Dakota.

Bismarck Planning Director; Bismarck, North Dakota.

Center Mayor and Town Council; Center, North Dakota.

Cumin Associates; Billings, Montana.

Eastern Montana Social and Community Services Task Force.

Energy Development Board of Mercer County.

Garrison Mayor; Garrison, North Dakota.

Lewis and Clark Regional Council Mandan Planning Director; Mandan, North Dakota.

McLean County Agricultural, Stabilization and Conservation Service Office; Garrison, North Dakota.

Mountain West Research; Billings, Montana.

North Dakota Business and Industrial Development Board.

North Dakota Combined Law Enforcement Council.

North Dakota Community Action Association.

North Dakota Energy Impact Office; Bismarck, North Dakota.

North Dakota Game and Fish Department; Bismarck, North Dakota.

North Dakota Geological Survey; Grand Forks, North Dakota.

North Dakota Health Department; Bismarck, North Dakota.

North Dakota Job Service; Bismarck, North Dakota.

North Dakota Social Service Board; Bismarck, North Dakota.

North Dakota State Fire Marshall; Bismarck, North Dakota.

North Dakota State Historical Society; Bismarck, North Dakota.

North Dakota State Public Service Commission, Reclamation and Siting Division; Bismarck, North Dakota.

North Dakota State Tax Department; Bismarck, North Dakota.

North Dakota State University, Sociology Department.

North Dakota State Water Commission; Bismarck, North Dakota.

Three Affiliated Tribes; New Town, North Dakota.

Underwood Mayor and Town Council; Underwood, North Dakota.

United States Bureau of Reclamation; Billings, Montana.

United States Fish and Wildlife Service; Bismarck, North Dakota.

United States Geological Survey, Conservation Division; Billings, Montana.

United States Geological Survey, Water Resources Division; Bismarck, North Dakota.

University of North Dakota, Office of Rural Health.

Washburn Mayor; Washburn, North Dakota.

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SUMMARY MATRIX
SAKAKAWEA TRACT
RESOURCE AND ENVIRONMENTAL CONSIDERATION

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Topography	Gently rolling.	Less contrasting topography with slight modification of drainage patterns.	Low	Good	
Geology and Minerals					
Geologic Hazards	None identified	None	N/A	Good	
Potential for Other Minerals	Low (Oil and Gas) - This tract is in the Williston Basin.	Low - There has been exploration activity in the area.	Mining could interfere with exploration and development of the oil and gas.	Good	
Paleontological Resources	Low - None identified to date.	Will improve knowledge of the resources near the mine.	Low	Good	
Soils and Reclamation Potential					
Soil Erosion Potential	Erosion potential low over most of the tract.	Slight increase during soil handling operations otherwise little change.	Minimal	Outstanding	
Toxic Elements in Soil	No problems	None	None	There has not been a need for this data.	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Chemicals Corrosive to Metal or Concrete	Corrosivity of most soils to: Untreated metal - High; Concrete - Low.	None	None	Outstanding	
Saline/ Sodic Soil Conditions	No problem. Glacial till derived soils usually don't have serious sodic conditions.	None	None	Outstanding	
Character of Subsurface Materials and/or Interburden	Up to 50 feet of glacial till over shale and sandstone. Ninety drill holes in the Underwood tract. Data indicates textures - medium and medium fine, pH - neutral to slightly alkaline, salts and sodium - low. The glacial till in this tract probably has similar characteristics.	Some instability problems (settling, piping) may appear primarily during the first 3 years from the onset of reclamation.	Minimal	Outstanding	
Reclamation Potential	Based on the soil suitability for cover of surface mined land, the chance for successful reclamation appears to be high. The breakdown of soil suitability is as follows: "Good" - 1,021 acres, 80%; "Fair" - 252 acres, 20%; "Poor" - 7 acres, 1%. The glacial till offers plenty of good material for reconstructing a productive soil profile.			Outstanding	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Hydrology					
Drawdown of Shallow Groundwater Levels	Many wells in and surrounding the tract rely on shallow groundwater for domestic and livestock supplies.	Wells finished in the mine disturbance zone near an open pit will have lowered water levels during mining.	Will affect between 4 and 19 wells used for domestic and livestock purposes.	Hydrology - Acceptable Well Inventory - Acceptable	This will be a short-term impact that will only occur to a few wells at a time as mining progresses through the tract.
Degradation of Groundwater Quality	Lignite water does not meet Public Health Service drinking water quality standards. It is acceptable for domestic and stockwater purposes since it is the best practical source.	Groundwater quality will be degraded in the tract and this impact can move down gradient into the surrounding unmined aquifers.	Will effect between 2 and 10 wells used for domestic and livestock purposes.	Hydrology - Acceptable Well Inventory - Acceptable Impact Prediction - Acceptable	The long-term impact of how far down gradient poor water quality will move is not known.
Vegetation					
Cropland	There are 663 acres of land in the tract that are currently being cropped.	Average annual loss of 17 acres excluding 362 total acres of summer fallow. Annual production on this 17 acres would be 488 bu. of wheat. Maximum loss in any one peak mining year would be 169 acres and 4850 bu. of wheat.	Moderate to high, depending upon individual operation. Low to moderate for overall tract production.	Good	
Rangeland	Average annual production is 137 AUMs.	Average annual loss of 4 AUMs. Each acre would be out of production from 10 to 15 years. Maximum loss for any one peak mining year would be 57 acres and 34 AUMs.	Moderate to high, depending upon individual operation. Low to moderate for overall tract.	Good	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Agriculture	There are 7 operators in the tract.	The same number of operators will be affected, to varying degrees, by a long-term but temporary loss of acreage for agricultural production.	Very significant to the operators involved.	Outstanding	
	22% of the involved operators' acreage is in the tract.			Outstanding	
	47% of the acreage in the tract is operated by lessees.	Nonowners will lose the use of their leased acreage with no compensation.	Significant to non-owners.	Outstanding	
Threatened or Endangered Species	There are no threatened or endangered species (on the Federal List) in the tract.	None	None	Good	
Land Use	Agricultural. Minor roads and local utilities are within the tract boundaries and State Highway 37 crosses the tract. Garrison is to the west of the tract.	Displacement of existing land use. Relocation or bypass of minor roads and local utilities would create a minor inconvenience. Expansion of residential and commercial areas in towns would displace additional existing use.	See Vegetation and Agriculture sections. Minor considering the region. See Economic and Social sections.	Acceptable	
Recreation Values	Less than 5% of tract used for recreation.	Loss of recreational areas and added stress on available recreational opportunities.	Limited recreational opportunities make impacts significant.	Good - Based on current studies.	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Aesthetics	Agricultural of high aesthetic quality but of low scenic value. Viewed principally from State Highway 37. Not an important part of views from Garrison.	Change in local views from Highway 37 in short term. No long term impact.	Moderate to low significance in short term. Insignificant in long term.	Acceptable	
Wildlife					
Sensitive Wildlife and Essential Habitats	Essential habitat for sensitive wildlife ranges from 20-70% of the areas for about 30 species. Whooping crane and northern swift fox are identified with the area.	Coal mining and attendent actions would severely disrupt and destroy locally significant wetlands and woodlands interspersed with native prairie which singley and in composite contitute the essential habitats for 30 sensitive wildlife and many more common wildlife. Offsite aquatic habitats of Douglas Creek, Missouri River, and Garrison Reservoir would be recipients of potential point and nonpoint pollution.	There would be a significant area loss to wildlife resources if strip mining occurs in the essertial wetland, woodlands and native prairie.	1980 CIR aerial photo interpretation by Fish & Wildlife Service, Western Energy and Land Use Team. Unsuitability Criteria Application Team (FWS, NDGP & BLM Biologists). Wildlife data quality is high.	
General					Increased poaching and disturbance would significantly reduce all wildlife populations in the region. If not controlled it would significantly reduce recreation opportunities.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Cultural/ Historical Values	No specific data available. Resources likely on the tract.	Loss of sites as a result of mining activity.	Unable to establish because no specific data is available.	Unsatisfactory because it is not available.	Present plans call for cultural resources survey in summer of 1981.
Net Energy Analysis	No fossil fuels are being produced from this tract.	A total of 0.2 million tons of coal (0.5 million tons of federal coal) will be produced annually.	Production: 6565 Btu/lb. of coal Consumption: 37.7 Btu/lb. of coal Ratio of production to consumption: 174.1	Acceptable	
Climate and Air Quality	Good	Increase in particulate concentration. Does not violate ambient air standard and does not consume allowable class II increment.	Insignificant	Fair	
		Social and Economic Considerations			
Employment	The community of Garrison has 2 inadequate services with present employment/ population.	Employment increases will occur in Garrison.	Low level of increased employment.	Acceptable	
Population	The community of Garrison has 2 inadequate services with present population.	Population increases will occur in Garrison.	Low level of increased population	Acceptable	
Regional Income	$4,560 estimated regional income per capita.	Very minor increases in regional per capita income.	Insignificant	Acceptable	
Infrastructure Assessment (Community Services)	Garrison - 2 inadequate services.	No change in community service adequacy.	Insignificant	Acceptable	Based on assessment of 15 community services.

SAKAKAWEA TRACT
UNSUITABILITY CRITERIA RESULTS

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
1. Federal land systems	No	---	No	---
2. Rights-of-way and easements	No	---	No	---
3. Buffer zones	Yes	As applicable.	No	Fed. regs. mandate that these areas be designated unsuitable with possible future exceptions.
4. Wilderness study areas	No	---	No	---
5. Scenic areas	No	---	No	---
6. Land used for scientific studies	No	---	No	---
7. Historic lands and sites	Unknown	---	Yes	Survey being scheduled.
8. Natural areas	No	---	No	---
9. Federally listed endangered species	Yes, Whooping Crane and Northern Swift Fox known or believed to use these regions.	---	Swift Fox data very limited.	Exclusion of strip mining from wetlands would protect most whooping crane areas.
10. State listed endangered species	No	---	No	Does not exist.

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
11. Eagle nests	No	---	No	---
12. Eagle roosts and concentration areas	No	---	No	---
13. Falcon cliff-nesting sites	No	---	No	---
14. Migratory birds	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	Seven species in combination with Criterion 15.
15. State resident fish and wildlife	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	About 30 species in combination with Criterion 14.
16. Flood plains	No	---	No	---
17. Municipal watersheds	No	---	No	---
18. National resource waters	No	---	No	---
19. Alluvial valley floors	No	---	No	---
20. State proposed criteria	No	---	No	Does not exist.

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